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fessor of vertebrate paleontology. He will retain his position at the American Museum of Natural History.

PROFESSOR ERNST GAUPP, of Königsberg, has accepted a call to the chair of anatomy at Breslau.

DISCUSSION AND CORRESPONDENCE

AGE OF THE TUXPAM BEDS

IN SCIENCE of February 10, 1911, the writer gave a preliminary sketch of the Tertiary deposits of northeastern Mexico. In this communication the beds occurring in the vicinity of Tuxpam with their wealth of fossils, which appeared to be largely new or undescribed species, were stated to probably belong to the Miocene, and this reference has been followed in later publications both by himself and by others.

While both gasteropods and bivalves were abundant at this locality, the most characteristic fossils of these beds were the echinoderms, which included great numbers of a very large *Clypeaster*, one or more species of *Schizodus*, *Macropneustes* and *Cidaris*. None of these special forms were reported by other observers from the region to the south of Tecolutla, but the similarity of the deposits of the lower coastal area seemed to indicate their continuity, and since such fossils as had been described from these continuations were considered of Miocene or Pliocene age, it seemed probable that the Tuxpam beds were also of that age.

During the examinations made in the coastal area between Tuxpam and Tampico since this publication, numerous collections of fossils have been made and these are now being examined. We find that the Tuxpam *Clypeaster*, *Cidaris* and *Macropneustes* occur elsewhere in connection with the nummulites, cristallaria and orbitoides of the Oligocene, but where we find this association we do not find the large number of gasteropods and bivalves which are found at Tuxpam, or on the San Fernando. The shells usually accompanying these echinoderms around Tampico are simply a small pecten, a nucula, and one or two small gasteropods. In some localities imprints of

leaves are abundant in the accompanying shales.

Such an association of fossils seems to require the reference of the Tuxpam beds to the Oligocene, and if this be true, it would appear that along the western gulf shore there is no marine Miocene on the surface between Tuxpam and Galveston. E. T. DUMBLE

NITER SPOTS

TO THE EDITOR OF SCIENCE: In a recent number of SCIENCE¹ is to be found an article by Sackett and Isham relating to the formation of "niter spots" in the arid regions of the western United States. In a more recent number of the same magazine² Stewart and Peterson have given a lengthy and interesting discussion of this paper and also a description of these brown spots. These later writers have attributed the origin of these nitrates to the leaching and concentrating action of irrigating water upon the nitrates occurring in the shales and sandstones (or country rock) adjacent to and underneath the affected areas from which the soil has been derived. Their field observations were in Utah, where they describe the appearance of brown "niter spots" in certain irrigated fields.

While making some geological investigations in northwestern Nevada in 1912 it was the present writer's pleasure to make some notes relating to brown "niter spots" occurring on the playas. The observations being in strict conformity with well-known principles of commercial niter formation, the necessity of much speculation before arriving at a conclusion as to their origin was obviated. It is trusted that the few simple facts recorded at that time will serve in giving some added light on the subject in hand.

In traversing the playas brown spots were frequently noted on the surface in connection with alkali salts. When the brown mixtures of earth and salts were tested they invariably showed large amounts of nitrates. In places on the surface where the brown color was not present no nitrates were noted. Pits dug failed to show nitrates at greater depths than

¹ N. S., Vol. XLII., p. 452.

² N. S., Vol. XLIII., pp. 20-24.

two to three inches beneath the surface. Jack rabbits inhabited the areas in great numbers and it was first observed that wherever alkaline waters had come in contact with their feces the water, which usually held in small puddles, took on a dark brown color not unlike that of the waters holding in many unclean barnyards after a rainstorm. The decomposition of the fecal matter appeared to be comparatively rapid when in contact with the alkaline waters or with the moist alkali soil and air. The animal refuse was observed in all stages of decomposition from the fresh droppings to the complete disappearance of the original organic material. With the evaporation of the waters which had been in contact with this refuse the soil took on the brown color noted and responded to tests for nitrates. Fecal matter from cattle and horses was later observed undergoing the same type of decomposition and producing similar brown spots containing nitrates. All of the water on the playas examined was of an alkaline nature.

Since these observations are in harmony with the established principles of niter formation in India there was no hesitation in concluding that the brown "niter spots" of the playas were, as far as examined, of animal origin.

From these Nevada observations it is safe to predict that in fields of the arid western states brown "niter spots" will appear when live stock is pastured in the same and alkaline waters are used for irrigation. In this connection it would be important to know if live stock was pastured in the fields in which Stewart and Peterson made their observations. This fact would seemingly have an important bearing on their conclusions.

WALTER STALDER

SAN FRANCISCO, CALIF.

SCIENTIFIC BOOKS

Historical Introduction to Mathematical Literature. By G. A. MILLER, Professor of Mathematics in the University of Illinois. New York, The Macmillan Co., 1916. Pp. xiii + 302.

This valuable work is decidedly unique. It

is not a history of mathematics, yet contains much accurate historical information. It is not a bibliography of mathematics, yet it says much about books, journals and dictionaries. It is not a volume on mathematical recreations, yet is most interesting reading. It is not a philosophy of mathematics, though it illumines such matters as Bertrand Russell's definition of mathematics as "the subject in which we never know what we are talking about nor whether what we are saying is true." It is not a collection of biographies, though brief sketches of twenty-five leading mathematicians are given in one of the chapters. The book gives much miscellaneous information on recent mathematical activity in different countries of the world. The organization of mathematical societies, the starting of mathematical journals, the trend of modern thought along the lines of arithmetic, algebra, geometry and analysis, are all presented in a popular and pleasing manner, by one who is able to take a broad view of the mathematics of to-day. Attention is given to topics of general interest, such as Fermat's last theorem, magic squares, systems of numeral notation, women mathematicians, the international commission on the teaching of mathematics. The purposes of the book, as expressed in the words of the author, are "to meet the needs of a text-book for synoptic and inspirational courses which can be followed successfully by those who have not had extensive mathematical training. It may also be used as a text-book for a first course in the history of mathematics, especially by those teachers who believe with its author that such a first course should largely concern itself with recent mathematical events and developments." This aim is achieved in an eminently satisfactory manner. The book meets a real want.

The list of books on the history and the teaching of mathematics, recommended by the author, is selected more particularly to meet the needs of English readers. This list makes it painfully conspicuous that there are at present no up-to-date general histories of mathematics in the English language. The best general histories are in the German language. In